COUNTY OF MAUI

Analysis of Alternative Forms of Ownership and Alternative Business Models for Maui County's Electric Utility Company

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EXECUTIVE SUMMARY

The principal goal for an electric utility is to provide safe, reliable, and affordable electricity; in addition, the State of Hawaii and the County of Maui recognize the need to eliminate reliance upon fossil fuels for both economic and environmental reasons. Three main inter-related objectives are desired for future electric service in Maui County:

1. Energy Security and Resiliency
2. Electricity Cost
3. Renewable Energy Integration

Guernsey was tasked by the County of Maui (the County) to complete an options analysis for electrical utility service within the County. The County desires to move to 100% renewable and sustainable energy as quickly as practicable and has concerns about the prospects of such progress under the status quo.

Guernsey believes the ideal path forward to meet the County's objectives is to organize, develop and enable a private entity akin to an Independent System Operator (ISO) or Regional Transmission Operator (RTO) to oversee the electric grid and energy market while ensuring a reliable power supply, adequate transmission infrastructure, competitive wholesale prices and fair access for renewable power. This approach has several notable advantages:

- There would be little physical infrastructure that would need to change hands, and as such the capital costs for this approach are relatively low. The ISO/RTO would need to acquire existing dispatch, monitoring and control equipment in order to manage the transmission/distribution system; however, the great majority of existing MECO generation assets along with MECO transmission and distributions wires would remain with MECO.
- This approach has the potential for quickest implementation, although a timeline is highly uncertain. The County would need to organize political capital to introduce, negotiate and enact enabling legislation at the State level which would take an unknown amount of time. However, given enough political willpower this route could be completed much more quickly than a negotiated sale or condemnation of the MECO assets, which could take five to seven years or longer.
- This approach can be implemented regardless of the outcome of the HEI/NextEra merger; whatever the regulated electric utility provider for Maui County might be, the utility would be subject to the jurisdiction of the ISO/RTO.
- This approach promotes competition by providing clear price signals and market transparency so that power producers of all types can make rational economic decisions; this approach also optimizes transmission planning such that all power producers are incorporated into planning and infrastructure improvement efforts.

Should the ISO/RTO approach be unacceptable or not capable of being accomplished, **Guernsey** believes that the most technically advantageous route to enhanced renewables integration must include a change of ownership of some or all of MECO's existing assets. At a minimum, MECO's transmission and distribution assets (including its dispatch control center) would need to be acquired by a third party, with such third party being empowered to function substantially similar to an ISO/RTO. If such empowerment could not be obtained, then MECO's generation assets would also need to be acquired to achieve the desired results.

Of the two primary alternatives for third-party ownership – cooperative or municipal – **Guernsey** believes the most practical choice to be a cooperative business model. Legal issues aside, there are practical considerations such as public procurement laws, collective bargaining and bond ratings that make the municipal route more problematic than following a cooperative path.

In order to purchase MECO's assets, a third party could expect to pay from a low of $525 million (book value) to a high of $867 million (replacement cost new less depreciation) depending on negotiations or the result of a condemnation / eminent domain action. In either a municipal or cooperative business model, it is expected that most if not all of the purchase price would need to be debt financed. The debt financings of either business model would include requirements for a debt service coverage ratio, or a multiple placed upon revenue requirements of the new utility; in the case of a cooperative, **Guernsey** expects this coverage ratio could be 1.25 or greater. Based upon our analysis, we find the debt service coverage ratio will offset some of the benefits of overall lower cost of capital and exemption from income taxes; however, overall utility rates could nevertheless decrease approximately six percent assuming the new owner can acquire the utility assets at close to net book value and operate those assets at least as efficiently as MECO currently does. Under a cooperative business model, the marginal revenue collections related to achieving the debt service coverage ratio would eventually be returned to customers in the form of capital credits. Capital credits are typically returned to customers in an orderly fashion on a rotational basis from ten to twenty years.

INTRODUCTION

Guernsey was tasked by the County of Maui (the County) to complete an options analysis for electrical utility service within the County. Options to be analyzed included alternative ownership structures (municipal or cooperative utility service), alternate utility organization (vertically integrated or split between generation and transmission/distribution) and the ability of those alternatives to accommodate and promote important objectives such as renewable energy and grid resiliency (such as microgrids). The County desires to move to 100% renewable and sustainable energy as quickly as practicable, and has concerns about the prospects of this progress under the status quo.

HISTORY OF HAWAIIAN ELECTRIC COOPERATIVES

Electric Cooperatives in Hawaii are relatively new. Kauai Island Utility Cooperative (KIUC) was formed in 1999 out of the assets of Kauai Electric Company. KIUC is the only Hawaiian Electric Cooperative that owns and operates assets. The Hawaii Island Energy Cooperative was formed in 2014 in anticipation of the potential to provide energy services on the Big Island. The brief history of each cooperative is discussed below.

ISLAND OF KAUAI

KAUAI ELECTRIC

- Formed in 1905 by McBryde Sugar
- Merged with Waiahi Electric Company in the 1950s
- Bought by Citizens Utilities Company in 1969
- In the late 1990s, Citizens Utilities decided to divest electric utility businesses
- In 1992, a hurricane devastated the infrastructure on the island; the system was insured by an HEI subsidiary, and the system was not able to recover quickly due to lack of capital from the insurer

KAUAI ISLAND UTILITY COOPERATIVE

- Local business leaders form Kauai Island Utility Cooperative (KIUC) in 1999
- KIUC purchases Kauai Electric Company assets in 2002 for $215 million in a friendly acquisition
- KIUC is the first co-op to own both generation and distribution (with the exception of a few small Alaskan village co-ops)
- KIUC is the newest electric cooperative in the United States
- The Hawaii Public Utilities Commission (PUC) generally holds KIUC in high regard
- KIUC's most recent strategic plan was lauded by the HPUC "By contrast, the Commission does note that the state's other electric utility (KIUC) has clearly articulated a strategic vision and made substantial progress in achieving their goals over the same time period." (Exhibit A: Commission's Inclinations on the Future of Hawaii's Electric Utilities)

ISLAND OF HAWAII

HILO ELECTRIC LIGHT COMPANY – HAWAII ELECTRIC LIGHT COMPANY

- Incorporated in 1894 as Hilo Electric Light Company
- Purchased by Hawaiian Electric in 1970
- Currently operates the electric system on Hawaii; merger with NextEra pending PUC approval

HAWAII ISLAND ENERGY COOPERATIVE

- Formed in 2014 as a Hawaii-registered 421c non-profit cooperative association
- Formed by community and business leaders to explore providing energy for the Big Island

MECO AND THE 100% RENEWABLE TARGET

The State of Hawaii has the most aggressive Renewable Energy Portfolio Standards in the United States; the recently passed legislation (House Bill 623, H.D. 2, S.D. 2, C.D.1 from the 28th legislature, 2015) calls for 100% renewable energy by 2045, with a requirement for 40% of "net electricity sales" to be from renewable sources by 2030. The Hawaii Clean Energy Initiative (HCEI 2.0) extends the initial program (HCEI 1.0) that called for 40% renewable energy by 2030, in conjunction with 30% avoided energy consumption through energy efficiency measures, for a combined 70% "clean energy" goal by 2030.

Significant progress has been made by Maui County since the inception of HCEI 1.0; expansion of renewable energy is primarily due to the implementation of large-scale wind farms and photovoltaic (PV) solar power facilitated by the Net Energy Metering (NEM) program.

However, current system renewable generation, as configured and managed by MECO, is limited and reaching a plateau. Especially on the Island of Maui, without significant investment to reconfigure the transmission and distribution system it does not appear likely that MECO can make the aggressive targets laid out by HCEI 2.0. As stated in the Hawaii PUC white paper entitled "Commission's Inclination on the Future of Hawaii's Electric Utilities", the "… HECO Companies appear to lack movement to a sustainable business model to address technological advancements and increasing customer expectations."

This is especially accurate in the case of developing and implementing micro-grid technology to optimize renewable resources. MECO was slow to respond to or properly anticipate and integrate the significant wind energy harnessed from Maui Island's two large-scale farms. The result was significant curtailment of available wind energy. Although a System Improvement and Curtailment Reduction (SICR) plan has been adopted, the overall management of renewable energy is still not optimized.

The Hawaii Renewable Portfolio Standards Roadmap Study provides a vision for attaining the 40% target set for 2030; however, the new targets of 70% by 2040 and 100% by 2045 require innovative solutions that can only result from a paradigm shift in the power generation scheme for Maui County. The PUC white paper provides an excellent outline of the basic elements of the roadmap for the system-wide technological and managerial components of the "electric utility of the future" (paraphrased):

- Creating a 21st Century Generation System – modernize the electricity generation systems on each island to effectively and efficiently integrate renewable energy sources.

- Creating Modern Transmission and Distribution Grids – modern, advanced electrical networks to integrate customer-sited distributed energy resources that expand energy options for customers to manage their energy usage.
- Policy and Regulatory Reforms to Achieve Hawaii's Clean Energy Future – necessary major changes to existing electric utility regulatory and rate structures to implement the guiding principles.

The critical issue is to determine the best organization and structure to achieve the desired results. Quoting the PUC paper "The Commission has not observed an acceptable course correction and there is not sufficient evidence, at this time, of progress towards developing and implementing a sustainable business model". Sustainability can be defined from multiple perspectives; the emphasis is usually on economic and environmental sustainability. Economic sustainability is applicable to both the utility and the community of ratepayers.

The vision presented by the PUC, and reinforced by both the Governor of Hawaii and Mayor of Maui County, is of a different kind of grid wherein there are a greater number of points of generation, including residential and commercial customers. In this model the utility service is an enabler of self-generation; the present Investor-Owned-Utility (IOU) structure is contrary to the new vision. An IOU is responsible to its shareholders, not the ratepayers, and uses a cost-of-service model where profits are provided through return on capital investment.

This traditional model promotes investor-owned generation, and the current IOU companies are generally not incentivized to economize on fuel. This model is changing however, and ultimately the burden of fuel cost will not be entirely borne by the ratepayer. The recently passed Bill 623 establishes HCEI 2.0 schedule and constraints; including the caveat that meeting "goals beyond 2030" must be "in a manner that is beneficial to Hawaii's economy in relation to comparable fossil fuel resources."

One of the driving factors behind the exploration of alternatives to MECO is the resistance to two proposed base-load renewable energy projects developed by Anaergia Services LLC (Anaergia):

1. *Integrated Waste Conversion and Energy Project* (IWCEP) – Anaergia's original proposal was to take all wastes (municipal solid waste, green, biosolids, fats oils and greases, construction debris, recyclables) to a material recovery facility and process the non-recyclables into renewable fuels. The proposed process would use a high-pressure press to separate solid from liquid fraction; the liquid fraction (organics) would be converted to bio-methane in an anaerobic digester, and the solid fraction would be used as a coal substitute. Both fuels were originally proposed for an on-site electric power generator. MECO imposed a requirement that the generation be dispatchable, rendering the original project economically unviable. Discussions with MECO evolved since the April 2013 contract award, and the most recent proposal was for MECO to purchase the biogas through a Fuel Supply Agreement (FSA).
2. *Maui Energy Park* – Anaergia proposed to take high-quality effluent from the Lahaina Water Reclamation Facility (LWRF) to be used in a biomass energy production facility. The project addresses two objectives: (1) reuse effluent as opposed to underground injection and (2) produce base-load renewable energy. There is a recent legal case wherein Maui County is blamed for an algal bloom in the ocean that is purportedly caused by effluent seeping out from the injection site. The settlement terms for the lawsuit require Maui County spend

$2.5M for projects to divert and reuse wastewater, as opposed to underground injection. Projects could include a pipeline to the Maui Energy Park to deliver high quality effluent for the Biomass Energy Plant capable of producing 6 MW, a significant contribution towards the HCEI 2.0 goals.

The situation has deteriorated over the past year such that Anaergia filed a complaint on September 9th, 2015 with the PUC stating that MECO was not complying with PUC direction to enable renewable projects. Anaergia also alleged MECO refused and failed to forward requests for preferential rates for the purchase of firm renewable energy produced from agricultural crops to the PUC for approval, as required by law.

MECO countered that pricing was too high for both projects, and would have resulted in increased costs to customers. Without significant analysis, it is difficult to say which party is correct (or more correct). Although not explicitly stated in the complaint, the drawback for any IOU with generation assets is its reluctance to curtail production, and hence reduce revenues, in deference to Independent Power Producers (IPP).

HEI/NEXTERA MERGER DISCUSSION

There are numerous advantages and disadvantages associated with the proposed NextEra merger with Hawaiian Electric Industries (HEI).

ADVANTAGES

- NextEra is a well-established mainland firm (45,000 MW under management) with extensive experience in the development and implementation of utility-scale renewable energy
- The company has a successful history from the shareholder perspective (over 300% total return over the past decade), and can provide ample personnel resources (nearly 14,000 employees) to address the issues facing Hawaii, and Maui County in particular
- NextEra has strong financial resources to enable major capital investments necessary to achieve the renewable energy goals, including transmission and distribution upgrades
- NextEra has demonstrated the incorporation of new perspectives and technical expertise in the development and deployment of micro-grids
- Access to capital resources may be improved with the merger as the revised entity will have a market capitalization approaching $50B (current capitalization of >$44B)

DISADVANTAGES

- As pointed out recently by Governor Ige, NextEra also has a history of discouraging customer sources of generation which is popular in Maui County, especially at the residential level
- Management control from outside the State of Hawaii further accentuates the gap between shareholder and ratepayer interests
- A merger reduces the potential for conversion of MECO to either a cooperative or to a municipal-owned structure (lost opportunity for conversion); condemnation is still an option for municipal ownership, but window for cooperative alternative is practically eliminated

BENEFITS AND DISADVANTAGES OF COOPERATIVE AND/OR PUBLIC POWER

Due to their different ownership structures and no requirement to produce income, municipal and cooperative electric utilities exhibit several notable advantages and some disadvantages when compared to large investor-owned utilities. Significant positives and negatives applicable to the County's tasking are described below.

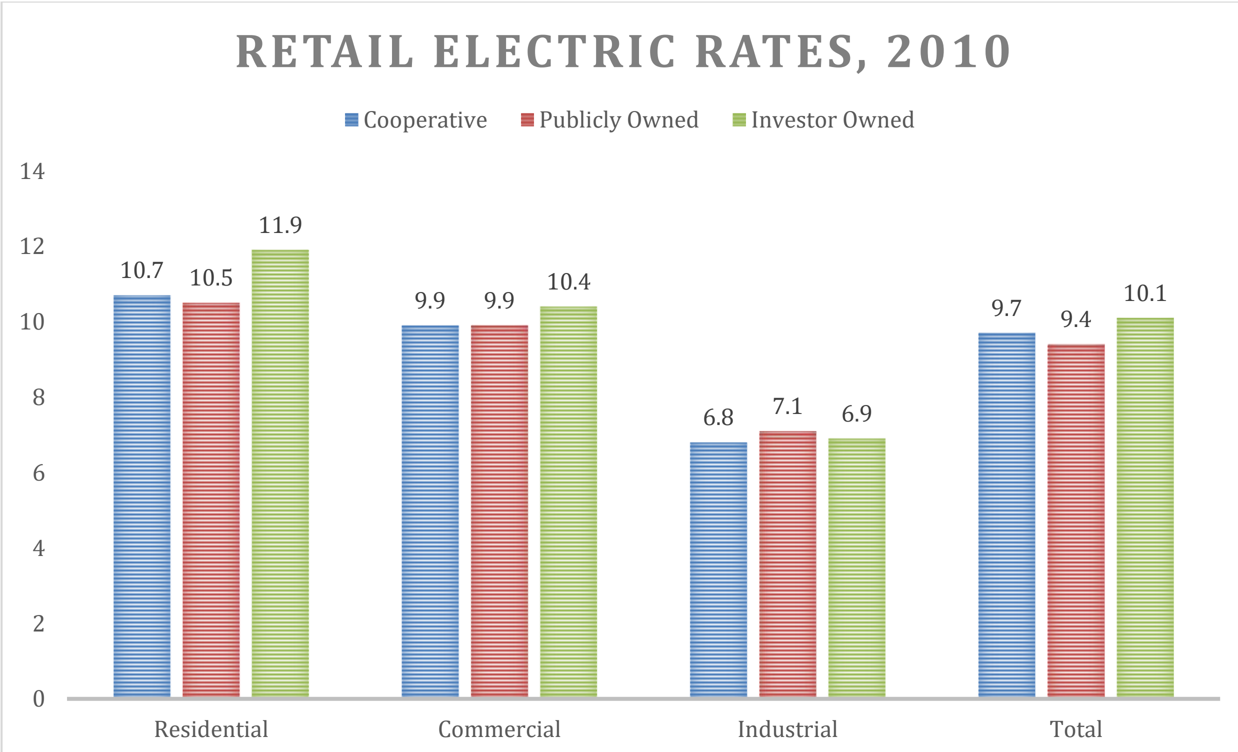
In a regional transmission organization (RTO), described in further detail below, member companies, market participants, and other stakeholders vote in and create an organization where all parties are treated the same under an open access or pro forma tariff. Any potential advantages or disadvantages are generally offset for each participant.

A regional transmission organization (RTO) oversees the electric grid and wholesale power market while ensuring a reliable power supply, adequate transmission infrastructure, and competitive wholesale prices. A properly functioning RTO would facilitate the alignment of the utility business models, customer interests, and public policy goals. Absent a functioning RTO there will be limited or no integration of participants because there is no market transparency or transmission tariff under which non-discriminatory services could otherwise be provided.

BENEFITS

LOWER RATES

As identified by the American Public Power Association (based upon United States Energy Information Administration Form EIA-861 for 2010) indicates that, on average, cooperatives and public power utilities have lower retail rates than investor-owned utilities (IOUs):



Lower rates are generally possible due to one or more of the following:

- The utility governing body is more accessible, and therefore accountable, to its customers;
- The utility is not-for-profit and does not pay dividends to stockholders;
- Rates are set locally, either by citizen-appointed boards, elected officials, or the utility board of member-owners;
- The utility is not subject to income tax;
- The utility may be able to issue revenue bonds that are exempt from federal income tax for capital expense, and
- The utility may have access to low-interest financing from a variety of cooperative banks and federal electric programs.

ASSET OWNERSHIP & LOCAL CONTROL

Cooperatives and public power utilities are often found to provide better, more reliable service because they are owned and managed locally. IOUs are often conglomerates that do not have significant local management resources, leaving important or strategic decisions up to people away from the system.

General benefits accruing to public power and/or electric cooperative utilities include the following:

- Local management control over decisions involving investments, operations, maintenance, power supply choices, customer programs

- Increased community control over management decisions, including how many dollars remain within the local economy and are invested in the local community as opposed to leaving in the form of dividends to distant stockholders
- Citizen-owners or customer-members with direct say in policies through elected or appointed officials/management
- Greater local customer participation in meetings and access to information on planning alternatives, cost estimates, performance and other types of reporting
- Higher responsiveness to customers' needs and concerns
- Dedication to power reliability, power quality, safety and efficiency that come from being singly focused on local operations
- Increased emphasis on long-term community goals
- Greater influence over electric distribution system aesthetics and design
- Economic development and jobs from lower rates that attracts or retains businesses
- Local employment with a larger portion of revenue retained in the community
- Utility management focused on local goals such as innovation, community technology development, and environmental stewardship
- For public power utilities, improved local government efficiency through integrated utility operations with other municipal utilities

RESPONSIVENESS AND ADAPTATION

Because electric cooperatives and municipal electric utilities are local they are typically more responsive to consumer needs and demands. Cooperatives and public power utilities are often quicker to adopt new technologies and methods of supplying electricity because their smaller size and local management structures allow them to be nimble and adapt to, or often lead, change in the electric utility industry.

For instance, the National Rural Electric Cooperative Association (NRECA) noted from a 2012 Federal Energy Regulatory Commission (FERC) survey that the cooperative industry leads electric utilities in advanced metering:

- Cooperatives' advanced metering penetration has surpassed 31 percent compared with 23 percent for the country as a whole
- Approximately half of cooperatives have installed at least some Advance Metering Infrastructure (AMI) on their systems
- 30 percent of cooperatives with AMI/AMR have begun to integrate their metering systems with other systems such as outage management systems, customer information systems and geographic information systems.

RENEWABLES, DISTRIBUTED GENERATION AND MICROGRIDS

Cooperative and public power systems are often leaders in adapting renewable power goals and integrating renewable energy into their systems.

Renewables

Cooperatives and public power entities are heavily involved in renewable energy. According to the NRECA, more than 90% of the cooperatives in the United States use renewable sources of electricity.

> According to recent NRECA data and the Solar Electric Power Association's "2012 SEPA Utility Solar Rankings," cooperatives located in eighteen states have more than 4,000 solar-powered consumer-owned residential DG projects, representing more than 23 megawatts (MW) of capacity. The addition of 700-plus commercial and industrial (C&I) projects brings cooperatives' solar-powered DG capacity to almost 53 MW.

Based on limited research, it appears that the position of NRECA regarding renewable energy is more advanced than APPA's position; public power relies heavily on more traditional power sources and is therefore more closely linked to fossil fuels. NRECA, being a collection of more rural systems, has the advantage of being closer to many forms of renewable energy, and is therefore more invested in renewable energy research and adaptation.

Distributed Generation

Cooperatives are invested in adopting and advancing distributed generation (DG). A 2013 NRECA report notes:

- Two-thirds of cooperatives interconnect with member-owned generation
- 75% have interconnection policies, up from 45% in 2009
- 45% purchase excess power from member-owned generation, up from 20% in 2009
- 47% offer net metering, up from 28% in 2009

Microgrids

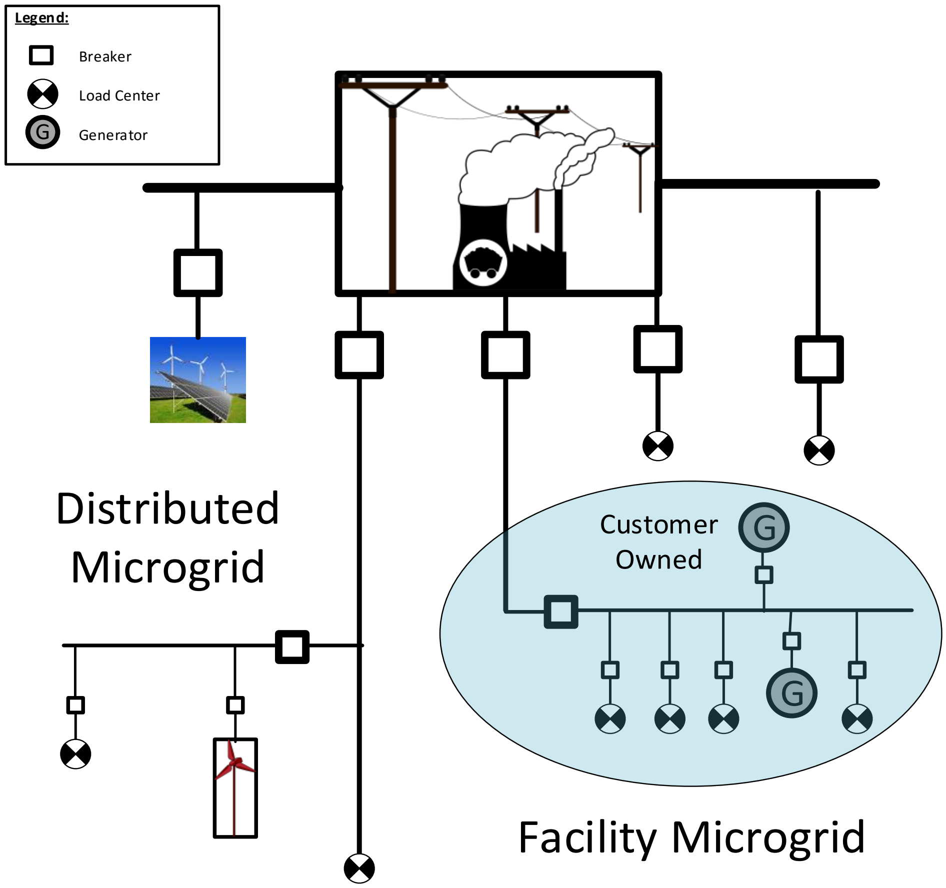
The Department of Energy (DOE) definition of a microgrid is:

"A microgrid is a group of interconnected loads and Distributed Energy Resources (DER) with clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid and can connect and disconnect from the grid to enable microgrid operation in grid-connected or islanded mode."

Any small-scale localized station with definable boundaries and its own power resources, generation and loads qualifies as a microgrid. Microgrids can be intended as back-up power or to support the main power grid during periods of heavy demand. Often, microgrids involve multiple energy sources as a way of incorporating highly desirable renewable energy resources. Other purposes include reducing costs and enhancing reliability.

As shown in the following figure microgrids can be broadly classified as:

1. Distributed microgrid, or
2. Facility microgrid



A more detailed classification of microgrids includes:

- Off-grid microgrids: Off-grid microgrids includes generators for remote locations and other microgrid systems not connected to a local utility network.
- Campus microgrids: Campus microgrids are fully interconnected with a local utility grid, but can also maintain some level of service in isolation from the grid, such as during a utility outage. Typical examples serve university and corporate campuses, prisons, and military bases.
- Community microgrids: Community microgrids are integrated into utility networks. Such microgrids serve multiple customers or services within a community, generally to provide resilient power for vital community assets.
- Nanogrids: Nanogrids are the smallest discrete network units with the capability to operate independently. A nanogrid can be defined as a single building or a single energy domain.

Fully grid-tied systems that can't operate in islanded mode cannot be classified as microgrids, but instead are defined as grid-tied DER. Also, backup systems that serve very specific, limited loads and are not capable of feeding power back to the grid are generally classified as uninterruptible power supply or backup systems and not microgrids.

The practice of using microgrids is also known as distributed, dispersed, decentralized, district or embedded energy generation. DERs on distributed microgrids are generally owned by the utility company or Independent Power Producers (IPPs) and are solely dispatched by the utility company or Independent System Operators (ISOs) for the safe, reliable and efficient operation of the grid. Facility microgrids are typically owned and operated by the customer and are dispatched by the customers based on their requirements.

With the more stringent environmental regulations, growing concerns for cybersecurity, and more frequent severe weather events utilities are increasingly exploring microgrid options to supply reliable power to their customers. DERs connected on a microgrid are typically interconnected via control logic to allow for:

- Optimization of economic dispatch
- Integration of renewable energy
- Emergency islanding
- Managing critical/non-critical loads to available generation
- Optimized island operation for fuel cost leveraging
- Energy resiliency and cybersecurity

The modular nature of microgrids could make the main grid less susceptible to localized disaster. Modularity also means that microgrids can be developed, step by step, to incrementally modernize the existing grid by strategically establishing microgrids in various locations across the grid during the process of modernization.

It is recommended that the following steps be performed for any microgrid project:

- Technical feasibility study
- Load flow analysis
- Dynamic simulation of the system
- Power protection and power quality studies, especially for island operation
- Relay coordination study
- Design
- Pre-deployment validation

Some of the technical challenges encountered while developing a microgrid project includes:

- Intermittent power availability from renewable energy (wind, PV etc.)
- Low system inertia (mostly from renewable energy sources) resulting in higher frequency and voltage fluctuations

Advantages of microgrids:

- Higher system efficiency due to reduced distribution losses
- Increased reliability of electric service
- Enhanced ability to integrate renewable energy
- Provides competitive environment as independent power producers can sell power to the grid

Disadvantages of microgrids:

- Can be expensive to construct, operate and maintain compared to similar size centralized system
- Legacy policies and regulations can create financing risks and challenges for microgrid projects
- Lack of technically knowledgeable personnel in remote locations
- Technical challenges associated with island operation and intermittent energy sources

Energy Storage

The fundamental structure of an (IOU) is predicated upon earning the regulated return on invested capital; hence it is not conducive to the consumer self-generation vision currently being touted. Municipal ownership, assuming administrative and budgetary autonomy, is pro-customer (voter) and is a business model more supportive of self-generation. All of the business models would discourage grid defections, as it would increase the cost to the remaining customers. The anticipated improvements in battery technology and resulting cost reduction will undoubtedly increase grid defections; however, the vast majority of electricity consumers prefer the security and safety of grid-connected electric service. In theory the business model most supportive of consumer self-generation is the cooperative model wherein the system savings are ultimately refunded to the customer-owners.

FINANCES

Despite being smaller than IOUs, electric cooperatives and public power utilities hold high financial standards for themselves and overall they are very well-financed.

Moody's Investors Service, 2009:

> "Additionally, public power electric utilities have shown an ability to manage through the recent turmoil in credit and fuel markets and there have been generally sound finances and reliable service to customers. There have been no public power credit rating downgrades related to the impact of the unsettled credit markets. Many utilities also have undertaken strategic efforts to begin to manage expected changes in environmental regulation."

DISADVANTAGES

ACCESS TO CAPITAL

Cooperatives and public power utilities have ready access to federal financing, revenue bonds and industry banking facilities but may have challenges attracting additional capital outside of these resources.

DEPTH OF EXPERTISE

Cooperatives and public power utilities are typically smaller, more locally-based operations and as a result may have trouble attracting talent and may not have as much back-up human capital in the event of emergency. Typically, cooperatives and public power utilities mitigate this weakness by belonging to statewide and national organizations that allow them to leverage the knowledge and resources of other utilities.

CHALLENGES TO IMPLEMENTATION

Lack of electric utility operation knowledge can inhibit the start-up of an electric utility. A typical mitigation of this would be to hire the most capable staff from the existing utility. Additionally, especially with public power, the new entity likely has expertise in other utility operations that can be extended over to the new utility, such as billing, human resources, and other administrative needs.

DISADVANTAGES SPECIFIC TO MAUI COUNTY

Municipalities in the United States operate under a broad variety of state laws, municipal charters and ordinances, case law, and labor/capital markets. Maui County's particular legal and commercial environment places it at somewhat of a disadvantage as compared to a cooperative electric utility business model.

Public Procurement Laws

- A cooperative would be a non-public entity, and as such would not be subject to public procurement laws.
- Conversely, were the County of Maui to own and operate an electric utility, that municipal utility would be subject to the County's existing public procurement laws. While such laws are established for good and valuable purposes, they do create inefficiencies when compared to private business entities; such inefficiencies typically result in increased capital and operational costs, and therefore increased utility rates to customers vis-à-vis private sector procurement practices.

Unions / Public Collective Bargaining

- A cooperative would be a non-public entity, and as such would not be subject to public collective bargaining laws. While it is possible that some or all of the workforce of a cooperative could elect to unionize, such action is not typical for the great majority of electric cooperatives in the United States.
- Conversely, were the County of Maui to own and operate an electric utility, that municipal utility would have to address collective bargaining challenges. **Guernsey** has direct experience with this issue through our consultancy to the City of Oklahoma City, which is seeking to purchase the water and wastewater utility assets of Tinker Air Force Base which the city surrounds. Oklahoma City's labor workforce is unionized, and in seeking to expand its service area Oklahoma City was highly concerned about the increased cost for the Air Force base, as well as the disruptions that would be caused in its existing workforce as personnel competed for the new positions. This concern was so great for Oklahoma City that it ultimately engaged legal counsel to determine whether an independent trust could be established such that it would be free from unionization challenges.

Bond Ratings

- The County of Maui currently enjoys strong bond ratings (AA+ from Fitch) which are a testament to prudent financial management and provide economic benefit to the citizens via lower cost of borrowing. Strong bond ratings also position the County well with access to capital markets, enabling relatively higher levels of borrowing should emergency or unplanned capital requirements arise.
- The book value of MECO's capital assets is estimated at approximately $525 million, which is likely the lowest purchase price for MECO's assets; in either a negotiated sale or a taking through eminent domain / condemnation it should be expected that the actual cost of acquisition would be higher. Acquisition of these assets would require bonding in excess of the County's total outstanding bonds and would markedly change the financial data upon which rating agencies form their opinions. This is not a barrier to pursuing a municipal electric utility but does present a significant challenge to County residents beyond mere electric service.
- A compounding complication with bonding is the cash flow necessary to support high bond ratings. Rating agencies look for a debt service coverage ratio (DSCR) that is a multiple of the minimum amount necessary to meet annual debt service; while agencies differ in what they find acceptable, a coverage ratio of 1.25 is a reasonable target. The end result is that unless other financial subsidy is provided, the municipal utility would have to charge its customers a multiple of the actual cost of debt service in order to achieve the highest bond rating possible. In this specific application, Guernsey estimates that an electric utility owned and operated by the County of Maui would actually have to charge higher rates than those currently charged by MECO, with a significant driver being the debt service coverage ratio.

DETAILS

COOPERATIVE VERSUS PUBLIC POWER

Public power and cooperatives have many comparable benefits over IOUs. However, there are a few key differences that stand out:

Ownership

- A cooperative is customer-owned and operated
- Public power is government-owned and operated

Taxes and Local Revenue

- Cooperatives pay local taxes, but are typically exempt from federal income tax. Cooperatives keep all revenue for reinvestment into the utility assets, typically returning excess revenue to its members over time.
- Public power typically does not pay local taxes or federal income tax. Public power systems typically make payments in lieu of taxes back to the municipal entity. Many also rely on revenue

transfers from the utility back to the municipality. If not safeguarded, this can result in the utility subsidizing local government at the expense of capital renewal of the utility assets.

Financing

- Cooperatives use a variety of financing methods, many of which are low-interest. Many receive loans from the Rural Utilities Service (RUS). Others receive financing from CoBank, the National Rural Utilities Cooperative Finance Corporation, or the U.S. Department of Energy.
- Public power is typically free to issue revenue bonds without votes of the people. Municipal revenue bonds are typically federal income tax-free.

Rate-Making

- Cooperatives may or may not be regulated by a state public utilities commission, but in Hawaii would be subject to such regulation. Rates would be proposed by the cooperative but would be set based upon a public regulatory proceeding.
- Public power rates are typically regulated by the municipality, either by a city council, or a board with such authority delegated to it and comprised in whole or in part by elected officials.

RECENT ACTIVITIES

According to APPA in 2013, “Electric utility ownership changes are relatively rare. During the last decade sixteen new public power utilities were formed. Twelve communities sold their public power systems, most of these to neighboring rural electric cooperatives.” A 2015 news article related to Boulder, Colorado’s municipalization (see below) effort upped the numbers to seventeen and thirteen, respectively.

Research indicates that Boulder is the largest entity currently undertaking a municipalization of its utility. Santa Fe, New Mexico is currently researching the possibility as well. Boulder and Santa Fe are pursuing municipalization particularly out of the desire to have renewable energy at the forefront of their electric supply.

New electric cooperatives are not formed at the pace of new public power systems. Information on new cooperatives is minimal at best; the most recent wholly new cooperative may actually be Kauai Island Utility Cooperative, a successful cooperative formed out of the assets of the previous electric utility on Kauai. Most ownership change activity in the cooperative market sector is via mergers or acquisitions with smaller adjacent public power or cooperative utility systems.

TECHNICAL FINDINGS

A high-level system inventory was created based on data available from MECO/HEI annual reports and primarily from estimations based on similarly-sized systems. A windshield tour of typical overhead infrastructure was also completed during the project kick-off site visit. In general, the portion of the transmission and distribution system visible to the public appears in good condition; plant inspections were not performed.

SYSTEM DESCRIPTIONS

Maui Electric currently serves the islands of Maui, Molokai, and Lanai, for a total of approximately 70,000 customers. Maui Electric serves approximately 150,000 residents on Maui, 7,500 residents on Molokai, and 3,100 on Lanai, as well as more than 2 million visitors per year.

MECO owns approximately 274 MW of firm capacity to serve Maui County, and it relies on another 16 MW of firm capacity from independent power producers. Additionally, Maui Electric utilizes approximately 127 MW of renewable power produced by independent power producers. MECO's current percentage of renewable use is approximately 33%.

ASSET CONDITION ASSESSMENT AND SYSTEM DEFICIENCIES

A detailed condition assessment of MECO's system was not part of this tasking and knowledge about existing system deficiencies is therefore somewhat limited. Utility assets were assumed to be in average condition for their age of original installation, and there are no major system deficiencies assumed.

LONG-TERM CAPITAL NEEDS RELATED TO SMART GRID/MICROGRID AND RENEWABLE ENERGY

The most significant need related to modernization of MECO's utility systems are those system improvements necessary to accommodate and promote greater integration of renewable and distributed energy into the utility grid. The territories served by MECO have significant existing renewable energy resources with even more capacity underway, but MECO's ability to accept all available resources is hindered by various technical issues, most notably the ability to maintain frequency, voltage and other aspects of power quality. Furthermore, the system peak at 7:30 PM is not well aligned with the production from renewable energy resources, and therefore significant storage resources will be required in order to progress toward 100% renewable energy. These capital upgrades are not insignificant and will require the commitment of substantial funding.

Besides wind and solar, MECO should look into feasibility of hydropower, including pumped energy storage during times on high wind and PV power production. Having pumped storage will diversify MECO's renewable energy resource. Expanded use of biofuel (biomass and biodiesel) in existing generators is another mechanism of enhancing the use of renewable energy that MECO should explore.

OPERATIONS AND MAINTENANCE ANALYSIS

The operation and maintenance (O&M) of the electric systems in Maui County, if purchased from MECO, would require new personnel, equipment, and facilities. It is assumed that existing operations staff from MECO would be offered positions with a new entity. Depending on MECO's willingness or unwillingness to sell to a new entity, existing equipment and facilities may also be acquired as part of a sale. If MECO is unwilling to part with these assets, new equipment and facilities will be required.

In a municipal power format, certain functions of O&M, such as human resources, payroll, purchasing, and accounting, could be rolled into existing County operations. However, the specialized aspects of electric generation, transmission, and/or distribution require highly trained personnel that typically are not or cannot be cross-trained with existing County functions. Therefore, the hiring of as many former relevant MECO personnel as possible would be prudent.

In a cooperative format, all functions of O&M would need to be acquired. While utility operations staff could be sourced from MECO's workforce currently providing service in the County, most clerical and administrative staff are located on Oahu and these functions would need to be hired outright.

DISTRIBUTION SYSTEM OPERATOR (DSO)

A distribution system operator (DSO) is typically an independent entity that has power and responsibility for balancing the local energy market and acting as a centralized sales/purchase authority. The DSO operates a dynamic distribution system that uses local resources for load tracking, voltage stabilization, and smoothing intermittent renewable energy production. The primary use of a dynamic distribution system is to integrate distributed energy resources (DERs) into the grid system.

Important dynamic distribution system features include:

- Plug-and-lay functionality in the distribution area
- Peer-to-peer sharing to DER resources
- Fast, autonomous control of load tracking, voltage and frequency
- Enable all generation resources to be included in the market
- Localized control

Major dynamic distribution system operation and control principles include:

- The system operators can continue to act as power balance authorities and transmission market providers
- Each local distribution area can have its own operator to act as a balancing authority and market provider
- Larger, more stable power resources have responsibility for providing bulk power
- DSO acts to minimize power flow volatility
- DSO has authority to adjust DER sources, use energy storage and other loads to minimize power flow volatility

In a cooperative format, all functions of O&M would need to be acquired. While utility operations staff could be sourced from MECO's workforce currently providing service in the County, most clerical and administrative staff are located on Oahu and these functions would need to be hired outright.

REGIONAL TRANSMISSION ORGANIZATION (RTO)

A Regional Transmission Organization (RTO) is a business structure that oversees the bulk electric grid and wholesale power market while ensuring a reliable power supply, adequate transmission infrastructure, and competitive wholesale prices. A properly functioning RTO would facilitate the alignment of the utility business models, customer interests, and public policy goals. Absent a functioning RTO there will be limited or no integration of participants because there is relatively little market transparency or a transmission tariff under which non-discriminatory services could be provided. Power exchanges between electric providers in the County are mostly facilitated through bilateral contracts and power purchase agreements. Creation of a Regional Pro Forma Tariff would resolve many integration issues, while providing the proper forum to do so.

An RTO is based on the concept of being reliability focused and is similar to an Independent System Operator (ISO), and while differences between the two are subtle they are also important. Generally, an ISO acts as the grid operator, administers the capacity and energy markets, and provides reliability planning for the transmission system. An RTO does the same things but has greater responsibility for the transmission network as established by the Federal Energy Regulatory Commission (FERC). RTOs were late to develop following behind ISOs. Generally RTOs made corrections to the mistakes caused in the marketplace by a rush to create ISOs, most notably in California and the western United States.

An RTO could facilitate a member-driven reliability and economic mission, to implement the PUC's "Inclinations" on the future of Hawaii's electric utilities by providing the following services:

- Reliability coordination: An RTO would monitor power flow throughout the Island and coordinate response in emergency situations or blackouts.
- Tariff Administration: An RTO would provide transmission services for use of the grid, including settlement services.
- Regional Scheduling: The RTO would ensure that the amount of power delivered is coordinated and matched with the power received.
- Transmission Expansion Planning: The RTO will identify system limitations, develop transmission system upgrade plans, and track project progress to ensure timely completion of expansion projects.
- Market Operations: The RTO could facilitate day-ahead, real-time balancing, and transmission congestion rights markets.
- Training: RTOs typically provide continuing education for operations personnel.

Pros and Cons of RTO versus Non-RTO Comparison of Distinguishing Characteristics Function	RTO	Non-RTO
With an RTO		
Voting privileges / policy influence	✓	-
Benefits of RTO to customer services	✓	-
Ability to use the Resource Management System	✓	-
Reliability coordination	✓	✓
Shared workload	✓	✓
Compliance with Membership obligations	✓	-
Defends FERC filing	-	✓
Manages Implementation protocols	-	✓
Coop manages Implementation protocols	✓	-
RTO Membership fee - directly paid	✓	-
Functional control to RTO	✓	✓
Return may be higher	✓	-
COOP defends its own FERC filing	✓	-
RTO Base Plan upgrade costs on Coop system	✓	✓
Tariff administration, RTO FERC fees	✓	✓
Withdrawal provisions apply	✓	-
RE monitoring and enforcement (NERC)	✓	-
Coop develops ATRR internally	✓	-
Subject to many third party interventions / delays	✓	-
Subject to refund with interest	✓	-
Requires annual maintenance	✓	-
Without an RTO		
Lease template easy to administer	-	✓
Can be terminated quickly	-	✓
Shares RTO workload	✓	✓
RTO Base Plan upgrade costs on Coop system	✓	✓
Based on RTO Financial Ratios	-	✓
RTO Costs passed through on load ratio share	✓	✓
Can conclude arrangements quickly	-	✓
Not subject to refund	✓	-
Maintenance free	-	✓

The creation of the pro forma tariff should be the first priority of the RTO.

Renewable energy, and the likelihood of battery costs declining that will enable more self-generation would be relatively insignificant as the RTO energy markets develop. Next-day and real-time generation across the grid will maximize cost-effectiveness, provide participants with greater access to reserve energy, improve balancing of supply and demand, and facilitate the integration of renewable resources, all while lowering costs. The fixed and variable cost of each assets should be dispatched against the total load served to determine the net cost to serve the load. Additional evaluations of renewable sources can then be valued.

For example, in the Southwest Power Pool (SPP), an RTO in the Midwestern United States, the generation mix on December 12, 2015 includes 26% wind energy, 3.7% hydro, and 1% solar. Clearly, renewables have a significant and growing role in the SPP. Wind energy is produced in low population areas and transmitted to the population and load centers under the transmission tariff using either point to point or network service over SPP qualifying facilities (substations and lines) greater than 60 kV.

CONSOLIDATED BALANCING AUTHORITY (CBA)

In a market with a pro forma transmission tariff, future revenues will be determined by power generators' ability to sell energy into the Consolidated Balancing Authority (CBA) of the RTO. It is important to understand what a CBA is and how it functions so that revenues can be verified or variances explained if revenues are different than expected. A Balancing Authority (BA) ensures that at every moment in time, and in plans for future times, there is sufficient generation to reliably supply electricity to meet load requirements. To meet the Commissions goals outlined in Section 1, a functional generation system is essential to lowering cost and increasing competition.

An RTO will serve as the CBA for the Island of Maui. As the CBA, the RTO will balance the Island's supply and demand, maintain frequency, and maintain electricity flows between adjacent BAs. The CBA must meet numerous North American Electric Reliability Commission (NERC) standards and criteria, and will have an obligation to NERC to meet performance standards.

The CBA will provide economic incentives and structure for the most efficient regional grid operation. The consolidated structure will offer market participants more reserve resources from which to draw, allowing the region to more efficiently meet NERC standards. The CBA will facilitate centralized unit commitment, in which the day-ahead market determines what generation resources should be utilized for maximum regional benefit.

DAY-AHEAD MARKET

Market participants will participate in the RTO day-ahead market that will provide a number of services for market participants, both buyers and sellers including:

1. Determining the least-cost solution to meet energy bids and reserve requirements.
2. Perform unit commitment.
3. Participants submit offers to sell energy and bids to purchase energy in the RTO day-ahead market:
    a. Energy offers to purchase and/or to sell will be possible.

   b. Regulation-up/regulation-down is offered and is the capability of a specific resource with appropriate telecommunications, control and response capability to increase or decrease its output in response to a regulating control signal to control for frequency deviations.
   c. Spinning reserves will be offered and are the extra generating capacity that is available by increasing the power output of generators that are already connected to the power system.
   d. Supplemental reserves will be available and are the non-spinning reserve or supplemental reserve is the extra generating capacity that is not currently connected to the system but can be brought online after a short delay. In isolated power systems, this typically equates to the power available from fast-start generators, however, in interconnected power systems, this may include the power available on short notice by importing power from other systems or retracting power that is currently being exported to other systems.
4. Co-optimize energy and operating reserves, and produces Locational Marginal Prices (LMPs) to meet energy bids and operating reserves.

NET COST TO OWN GENERATION (NCO)

Guernsey recommends comparing the variable cost of each generator in the proposed RTO to the LMP to determine if the new resource was dispatched to meet the total RTO load. The RTO should define the LMP as consisting of three components: the system marginal price for the entire RTO, cost of congestion, and marginal losses. The cost drivers of the LMP will be the system marginal price (market price); therefore, this is the price that was compared to the total variable costs of the new resources considered to determine its revenue in the integrated market. Transmission congestion rights sufficient to cancel any congestion cost should be considered.

The RTO will dispatch generation. Sales revenue will be based on how the individual-owned assets fit into the system-wide dispatch of all RTO resources. **Guernsey** suggests modeling the entire RTO in a load versus hourly dispatch to arrive at the system marginal cost for the forecast period. Ventyx, owners of a computer simulation model used by **Guernsey** called Promod, typically provides the forecasted loads for each balancing authority, based on FERC Form 714. Ventyx also provides a database of existing resources and an expansion plan to meet regional capacity requirements for the study period. The RTO would run a resource like Promod (hourly production cost model) to simulate and evaluate the dispatch of all generation resources to determine savings.

The revenue from a resource is therefore defined as [hourly generation] x [market price]. The expense of a resource is defined as [hourly generation] x [fuel cost plus variable O&M]. The net dollar margin is the difference of the revenue and expense. The net dollar margin will be used to offset the fixed cost to own and operate the unit and will determine the Net Cost to Own (NCO) the resource. In formula form:

Net Cost to Own (NCO) =
Fixed cost – ([hourly generation] x [market price] - [hourly generation] x [fuel cost plus variable O&M])

The RTO would calculate the NCO for each existing and proposed installation to optimize the supply and lower the energy cost for Maui County.

LACK OF FERC JURISDICTION FOR HAWAII

On April 24, 1996, the Federal Energy Regulatory Commission (FERC) issued Order 888 requiring all public utilities that own, control or operate facilities used for transmitting electric energy in interstate commerce to have on file open access non-discriminatory transmission tariff that contain minimum terms and conditions of non-discriminatory service. FERC's goal was to remove impediments to competition in the wholesale bulk power marketplace and to bring more efficient, lower cost power to electricity consumers. Regional Transmission Organizations (RTOs) were created by FERC Order 2000, issued on December 29, 1999. Other third-party grid operators are called Independent System Operators (ISOs). The terms RTO / ISO are used interchangeably in this summary except where specified.

Unfortunately, due to Hawaii's geographic displacement its electric customers cannot benefit directly from FERC jurisdiction. However, the state of Texas provides an example of how a state can accomplish the same objectives of FERC Order 888 without participating in interstate commerce. The transmission grid that the Electric Reliability Council of Texas (ERCOT) administers is located solely within the state of Texas and is not synchronously interconnected to the rest of the United States and is an ISO. The transmission of electric energy occurring wholly within ERCOT is not subject to FERC jurisdiction under many sections of the Federal Power Act. Both RTOs and ISOs are very successful to achieving significant fuel cost reductions, deferral of capital expenditures, and creating market access as well as other societal benefits such as increased use of renewable energy. A similar approach could be adopted by the County.

HOW AND RTO/CBA CAN ENABLE THE COUNTY TO INCREASE INTEGRATION OF RENEWABLES

RTOs can act as a market for power. Most are set up as nonprofit corporations using governance models developed by or modeled after FERC precedent. RTOs mitigate market power and utilize least-cost economic dispatch as much as possible and increase competition to protect consumers from monopoly power. The use of renewable energy resources to generate electricity has the potential to be a cost-effective means not only to reduce greenhouse gas emissions but also to diversify fuels and increase the amount of energy produced from renewable sources used to generate energy. FERC through RTOs and ISOs has worked to pursue market reforms to allow all resources, including renewable energy resources, to compete in jurisdictional markets on a level playing field. These efforts include amendments to market rules, modification or creation of ancillary services and related policies, or the implementation of operational tools that support the reliable integration of renewable resources.

Further study of an RTO/ISO environment would identify the impact of renewable penetration on the scope and level of required reserve capacity and generation patterns. Based on engineering production cost analysis and considering transmission congestion and a review of best practices of renewable integration, specific policy and market design recommendations can be made for the successful integration of higher levels of renewable resources, as has been the case in most of the United States such as in the Southwest Power Pool (SPP). Compliance with the North American Electric Reliability Corporation (NERC) standards should also be required. Considerable time and effort is required on the front-end to perform a cost/benefit projection.

HOW AN RTO WOULD OPERATE WITH OR WITHOUT COUNTY OWNERSHIP OF INFRASTRUCTURE

An RTO under could operate with or without the County performing the Balancing Authority (BA) functions of the collection of generation, transmission, and loads within the metered boundaries. The BA would be the entity that maintains load interchange-generation balance. In coordination with the energy marketplace, any current BAs would be combined to form a single BA. An Open Access Same-Time Information System (OASIS) would be maintained for transmission access data and to allow all transmission customers to simultaneously view the data. A Real-Time Balancing Market (RTBM) would operate continuously to balance the system through generating unit deployment and economic dispatch signals through an energy management system. An independent third-party operator, or the County, theoretically could make the same application for approval as long as all the qualifications further identified below are met.

An example of state oversight is ERCOT which is governed by a sixteen-member board of directors, subject to oversight from the Public Utility Commission of Texas and the Texas legislature. Its members include consumers, cooperatives, generators, power marketers, retail electric providers, investor-owned electric utilities (transmission and distribution providers) and municipal-owned electric utilities. ERCOT has some of the highest wind penetration levels in the world.

CHARACTERISTICS AND FUNCTIONS TO FORM AN RTO

FERC encouraged the voluntary formation of RTOs to administer transmission grids and to remedy undue discrimination. Major reforms were consistency and transparency in available capacity calculation; open, coordinated and transparent planning, and increased transparency and customer access to information. In Order 2000, FERC defined a RTO as having four minimum characteristics and eight minimum functions.

Characteristics

- Independence: an RTO should be independent from its market participants in financial interests, decision-making, and tariff-setting.
- Scope and regional configuration: the region for an RTO should be chosen to achieve the necessary regulatory, reliability, operational, and competitive benefits.
- Operational authority: an RTO must have the authority to control its transmission facilities (e.g. switching elements in and out of service, monitoring and controlling voltage) and must be the security coordinator for its region.
- Short-term reliability: an RTO must ensure the region meets reliability standards.

Functions

- Tariff administration and design: in order to ensure don-discriminatory transmission service, an RTO must be the sole provider of transmission service and sole administrator of its own open access tariff.
- Congestion management: an RTO must ensure the development and operation of market mechanisms to manage transmission congestion.

- Parallel path flow: an RTO must develop and implement procedures to address parallel path flow issues within its region and with other regions.
- Ancillary services: an RTO must serve as the supplier of last resort for all ancillary services and determine if the minimum amount of ancillary services have been supplied.
- OASIS and Total Transmission Capability (TTC) and Available Transmission Capability (ATC): an RTO must be the single OASIS site administrator for all transmission facilities under its control and independently calculate TTC and ATC.
- Market monitoring: an RTO must monitor market behavior and report market power abuses and market design flaws to FERC.
- Planning and expansion: an RTO must have ultimate responsibility for both transmission planning and expansion within its region that will enable it to provide efficient, reliable and non-discriminatory service.
- Interregional coordination: an RTO must coordinate its activities with other regions, if appropriate.

RTOs and ISOs usually evolve from regional planning authorities responsible for planning and fostering reliability solutions for member participants; one such example is SERC Reliability Corporation which has not yet converted to an RTO/ISO. Having an operations center in place would accelerate the time necessary to form an RTO or an alternative organization. Experienced management personnel who are qualified to lead the transition is the critical path issue regarding timeline/schedule.

LEGAL MATTERS

Guernsey reviewed the Grant of Franchise from the Island of Maui to MECO. In general, the franchise is consistent with franchises typically provided to electric utilities in other jurisdictions. For purposes of this analysis, several aspects of the franchise bear mention:

- The franchise is specifically non-exclusive, meaning one or more additional franchises for the manufacture, sale, and supply of electric current could be granted without violating the terms of MECO's franchise.
- The franchise makes no provision for a right of first offer, right of first refusal or other similar provision for any utility assets used to provide service under the franchise.
- The franchise is silent on the topic of transferability; there is no specific provision or inference to allow transfer of the franchise from MECO to another franchisee.

Guernsey also reviewed current Hawaii statues and regulations related to provision of electric utility service by county governments. **Guernsey** found no provision for county-provided electrical service, either in the Hawaii Constitution or its statutes. Some states are openly hostile to county/municipal provision of electric utility service, going as far as to explicitly prohibit the practice. On the other end of the spectrum, other states actively enable delivery of electric utility service by county or municipal governments. Hawaii stands in a somewhat neutral position, neither permitting nor prohibiting county/municipal operation of electrical utilities.

FINANCIAL VALUATIONS AND FORECAST

Guernsey obtained publically available financial information for MECO, including MECO's most recent FERC Form 1 filing and elements of MECO's most recent filing with the PUC that were not confidential.

RCN, RCNLD, AND FMV

DESCRIPTION OF RCN, RCNLD AND FMV

Utility system values can be completed in three general steps: Replacement Cost, New (RCN), Replacement Cost New, Less Deprecation (RCNLD) and Fair Market Value (FMV). The RCN provides a general overview of what an asset or utility system would cost to construct new; this calculation provides the foundation for the RCNLD and FMV.

When reviewing a utility purchase, the FMV provides a comparison point for determining the adequacy of a purchase or concession price for a utility system. In some asset purchase cases, the FMV, at a minimum, must be paid to the seller to meet statutory requirements. In other cases, typically lease and/or operations and maintenance (O&M) contracts, FMV is often the baseline by which a purchaser provides a concession payment for the exclusive opportunity to lease and provide utility services. Therefore, the FMV is crucial when evaluating a potential transaction.

CALCULATING RCN, RCNLD AND FMV

Replacement Cost New (RCN) is calculated by multiplying quantities of utility infrastructure by their unit cost to achieve a summation of all costs. The unit cost is a current-year cost that includes the material and labor costs required to construct the assets. The RCN is a summation of all costs required to build the facility as if it were wholly new (also known as new construction). For those utilities that have aged components that would no longer be used in modern construction, this RCN is calculated to replace the functionality of the aged component with modern construction materials or approach. (For example, the cost to replace an existing non-standard material would be determined by substituting a suitable modern material.) These RCN unit costs will be estimated primarily from the following sources:

- R.S. Means Co. Building Construction Cost Data. Kingston, Massachusetts. 2015 (RS Means)
- Historical cost information from like systems and locations

ASSET QUANTITIES X UNIT COSTS = RCN

Replacement Cost New, Less Depreciation (RCNLD) takes the RCN and subtracts the accumulated depreciation associated with each asset. Accumulated depreciation is calculated based on the age of the asset and its expected useful life; the RCN is multiplied by the percent of useful life already consumed, which creates a value for accumulated depreciation. The RCNLD is then calculated by subtracting accumulated depreciation from the RCN.

RCN - (Percent of Useful Life Achieved x RCN) = RCNLD

Fair Market Value (FMV) is a summation of the RCNLD and current work-in-progress. In most instances, the RCNLD and FMV are equal; in cases where expansions or asset replacement are underway, or the facility has stockpiles of extra material, the FMV may be higher than the RCNLD. Due to lack of definitive information about asset ages, system components were assumed to have an average age of 20 years.

RCN AND RCNLD/FMV FINDINGS

The estimated RCN and FMV, calculated in 2015 US dollars, are:

- RCN: $2,824 million
- RCNLD/FMV: $867 million

LCCA

A basic Life-Cycle Cost Analysis (LCCA) was completed for the assumed system (see Technical Findings). The LCCA includes the 50-year estimated Renewal and Replacement (R&R) plan, based on system age and design life, plus the assumed cost of Operations and Maintenance (O&M) over a 50-year period. Renewals and Replacements are investments in the utility system to renew or replace system components that fail or reach the end of their useful life. The O&M required is based off of similarly-sized and/or scaled systems.

Infrastructure items are identified for R&R when the age exceeds its assumed design life. For example, a line installed in year 1995 with a 40-year design life would be projected for replacement in 2025 (1995 + 40 = 2035). The cost of replacing the item (the RCN value) will be allocated in the year of the project when a given piece of equipment/infrastructure expires.

The LCCA indicates that over the next 50 years, just over $4 billion would be required to purchase and recapitalize the system, based on the assumptions in the inventory, R&R and O&M plans. This number is basic and subject to multiple considerations such as adaptation of distributed generation, smart grids, microgrids, changes in power supply technology and methods. This LCCA cost does not include fuel costs, and assumes operation of the system as it exists today.

RATE IMPACT ANALYSIS

Using Docket No. 2011-0092 MECO Revised Results of Operations, Tariff Sheets and Refund Plan (The Plan) the MECO existing and proposed cost of service was separated into Production, Transmission, Distribution, and Customer Accounts functions. Exhibit 5, Pages 63 and 64 contain the data used in the development of Table 1.

Table 1
DETAIL OF EXISTING AND PROPOSED COST OF SERVICE
$000s

	Residential	General Service Non-Dem	General Service Demand	Large Power	Street Lighting	Current Revenues	% of Total
Production	$ 115,578	$ 28,589	$ 77,826	$ 109,348	$ 1,388	$ 332,728	85.8%
Transmission	$ 3,290	$ 1,190	$ 3,109	$ 4,100	$ (2)	$ 11,686	3.0%
Distribution	$ 16,579	$ 4,382	$ 7,111	$ 4,964	$ 399	$ 33,435	8.6%
Customer Accounts	$ 6,347	$ 1,509	$ 1,165	$ 748	$ 20	$ 9,788	2.5%
Total Existing	**$ 141,794**	**$ 35,669**	**$ 89,210**	**$ 119,160**	**$ 1,805**	**$ 387,638**	**100.0%**
O&M Expense	$ 113,253	$ 26,117	$ 65,786	$ 90,598	$ 1,933	$ 297,687	76.8%
Depreciation Exp.	$ 8,489	$ 1,880	$ 3,387	$ 3,655	$ 303	$ 17,713	4.6%
Amort-Inc. Tax Credit	$ (123)	$ (27)	$ (46)	$ (49)	$ (5)	$ (250)	-0.1%
Revenue Taxes	$ 12,592	$ 3,167	$ 7,920	$ 10,579	$ 164	$ 34,422	8.9%
Payroll Taxes	$ 793	$ 180	$ 319	$ 377	$ 18	$ 1,687	0.4%
Income Taxes	$ 1,101	$ 1,327	$ 3,906	$ 4,679	$ (276)	$ 10,737	2.8%
Existing Return	$ 5,689	$ 3,025	$ 7,939	$ 9,321	$ (332)	$ 25,641	6.6%
Total Existing	**$ 141,794**	**$ 35,669**	**$ 89,210**	**$ 119,160**	**$ 1,805**	**$ 387,638**	**100.0%**
O&M Expense	$ 113,253	$ 26,117	$ 65,786	$ 90,598	$ 1,933	$ 297,687	75.8%
Depreciation Exp.	$ 8,489	$ 1,880	$ 3,387	$ 3,655	$ 303	$ 17,713	4.5%
Amort-Inc. Tax Credit	$ (123)	$ (27)	$ (46)	$ (49)	$ (5)	$ (250)	-0.1%
Revenue Taxes	$ 12,750	$ 3,207	$ 8,020	$ 10,712	$ 166	$ 34,854	8.9%
Payroll Taxes	$ 793	$ 180	$ 319	$ 377	$ 18	$ 1,687	0.4%
Income Taxes	$ 1,731	$ 1,485	$ 4,302	$ 5,208	$ (268)	$ 12,458	3.2%
Proposed Return	$ 6,677	$ 3,274	$ 8,561	$ 10,152	$ (320)	$ 28,344	7.2%
Total Proposed	**$ 143,569**	**$ 36,116**	**$ 90,327**	**$ 120,652**	**$ 1,828**	**$ 392,492**	**100.0%**

The Plan Exhibit 5, pages 1 and 60 were used to determine the proposed operating income statement for MECO after the across-the-board 1.25% increase. From this income statement Hawaii and Federal income taxes were removed. The resultant income statement reflects the revenues and operating expenses assuming a not-for-profit ownership. A reduction in revenues of $9,613,000 could be made to result in a 1.25 DSC (debt service coverage) ratio assuming the not-for-profit entity borrowed $525,716,000 to purchase the MECO net plant, fuel inventory, and materials and supplies at 2012 book cost. In addition the loan would include $37,422,000 in working capital; this value is 12.5% of O&M.

Table 2
DEVELOPMENT OF COOPERATIVE REVENUE REQUIRMENT
$000s

	Current MECO	Rate Increase	Proposed MECO	Inc. Tax Removal	Proposed MECO w/o IT	Cooperative Adjustments	Cooperative Cost of Serv.
Revenues							
Sales Revenues	$ 387,638	$ 4,706	$ 392,344	$ (14,072)	$ 378,272	$ (9,613)	$ 368,659
Other Op. Reveneus	$ 1,677	$ 148	$ 1,825	$ -	$ 1,825	$ -	$ 1,825
Total Revenues	$ 389,315	$ 4,854	$ 394,169	$ (14,072)	$ 380,097	$ (9,613)	$ 370,484
Expenses							
Fuel	$ 159,066	$ -	$ 159,066	$ -	$ 159,066	$ -	$ 159,066
Purchased Power	$ 95,931	$ -	$ 95,931	$ -	$ 95,931	$ -	$ 95,931
Other Production	$ 11,449	$ -	$ 11,449	$ -	$ 11,449	$ -	$ 11,449
Transmission	$ 2,623	$ -	$ 2,623	$ -	$ 2,623	$ -	$ 2,623
Distribution	$ 8,894	$ -	$ 8,894	$ -	$ 8,894	$ -	$ 8,894
Customer Accounts	$ 4,235	$ -	$ 4,235	$ -	$ 4,235	$ -	$ 4,235
Uncollectibles	$ 301	$ -	$ 301	$ -	$ 301	$ -	$ 301
Customer Service	$ 1,176	$ -	$ 1,176	$ -	$ 1,176	$ -	$ 1,176
Admin. & General	$ 14,012	$ -	$ 14,012	$ -	$ 14,012	$ -	$ 14,012
Total O&M Expenses	$ 297,687	$ -	$ 297,687	$ -	$ 297,687	$ -	$ 297,687
Depreciation Expenses	$ 17,713		$ 17,713	$ -	$ 17,713	$ -	$ 17,713
Public Service Co Tax	$ 22,893	$ 286	$ 23,179	$ (829)	$ 22,350	$ (567)	$ 21,783
Public Utilities Com Tax	$ 1,945	$ 24	$ 1,969	$ (70)	$ 1,899	$ (48)	$ 1,851
Franchise Royalty Tax	$ 9,683	$ 121	$ 9,804	$ (351)	$ 9,453	$ (240)	$ 9,214
Property Tax	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Payroll Tax	$ 1,687	$ -	$ 1,687	$ -	$ 1,687	$ -	$ 1,687
Income Taxes	$ 11,351	$ 1,720	$ 13,071	$ (13,071)	$ -	$ -	$ -
Amortized ITC	$ (250)	$ -	$ (250)	$ 250	$ -	$ -	$ -
Int. on Cust. Deposits	$ 260	$ -	$ 260	$ -	$ 260	$ -	$ 260
Total Other Op. Exp.	$ 65,282	$ 2,152	$ 67,434	$ (14,072)	$ 53,362	$ (854)	$ 52,507
Total Operating Expenses	$ 362,969	$ 2,152	$ 365,121	$ (14,072)	$ 351,049	$ (854)	$ 350,194
Return	$ 26,346	$ 2,702	$ 29,048	$ (0)	$ 29,048	$ (8,758)	$ 20,290
Principal payments							$ 9,374
Interest payments							$ 21,029
Debt Service Coverage							1.25

The MECO rate base, as detailed on The Plan, Exhibit 5, page 1 is used to determine the cash requirements (loan requirements) for the new not-for-profit ownership. Items related to income taxes have been removed. Working Cash is 12.5% of the O&M cost of $297,687,000 from Table 2; 12.5% is a level of Working Cash typically allowed by regulatory commissions.

Loan requirements could be reduced by the Fuel Inventory ($17,463,000), Contributions and Advances ($78,510,000) and Other Deductions ($14,075,000). This $110,048,000 reduction in loan requirement would reduce the not-for-profit revenue cost of service by approximately $8,000,000.

The loan requirements do not include any “good will” adder that MECO may advocate.

Table 3
COOPERATIVE CASH REQUIRMENTS
$000s

	Proposed MECO	Adjustments	New Cash Requirements
Net Plant in Service			
Plant in Service	$ 859,283	$ -	$ 859,283
Accumulated Depreciation	$ 416,769	$ -	$ 416,769
Net Plant in Service	$ 442,514	$ -	$ 442,514
Other RB Items			
Plant Held for Future	$ 1,503	$ -	$ 1,503
Fuel Inventory	$ 17,463	$ -	$ 17,463
Materials & Supplies	$ 12,739	$ -	$ 12,739
Working Cash	$ 9,930	$ 27,492	$ 37,422
Contributions & Advances	$ (78,510)	$ 78,510	$ -
Deferred Income Taxes	$ (44,892)	$ 44,892	$ -
Unamortized ITC	$ (11,427)	$ 11,427	$ -
Other Deductions	$ 14,075	$ -	$ 14,075
Total Other Rate Base Items	$ (79,119)	$ 162,321	$ 83,202
Rate Base	$ 363,395	$ 162,321	$ 525,716

Debt service (Principal and Interest) cost is developed using an interest cost of 4% and a 30-year repayment term. The debt service coverage requirement is assumed to be 1.25 times the return plus the annual depreciation and interest expenses.

Sensitivities could be run on the debt service coverage ratio. Distribution-only cooperatives typically have a 1.35 times requirement, while generation and transmission cooperatives typically have coverage requirements below 1.25 times. **Guernsey** used the 1.25 times requirement as a measure of conservatism.

Table 4
COOPERATIVE REQUIRED RETURN
$000s

Cash Requirements	$ 525,716
Interest Rate	4.00%
Term - Years	30
Principal Payment	$ 9,374
Interest Payment	$ 21,029
Depreciation Expense	$ 17,713
DSC Coverage	1.25
Required Operating Margins	$ 20,290

SUMMARY MATRIX

The following matrix provides a summary of the various options analyzed for this report.

		Ownership			Operations	
		IOU	Coop	Public	G&T/IPP	RTO
Advantages	Potential for Lower Rates		X	X		X
	Reliable Power Supply	X	X	X	X	X
	Achieve 100% Renewable Target Early		X	X		X
	Share Admin. Staff w/ County			X		
	Hire Existing Power Company Staff		X	X		X
	Lower Capital Costs/Low-Interest Financing		X	X		X
	Responsive to Distributed Generation		X	X		X
	Integrate Independent Power Producers		X	X		X
	Encourage Implementation of Energy Storage		X	X		
	Local Control		X	X		X
	Not-for-Profit		X	X		X
	Local Ratemaking Process		X	X		
	Governed by HPUC		X			
	Governed by County			X		
	Governed by FERC					X
	Tax-Exempt Revenue Bonding Authority		X	X		
	Citizen Ownership			X		
	Customer Ownership/Membership		X			
	Quicker Adoption of New Technology		X	X		X
	Amenable to Establishing Microgrids		X	X		X
	Strong Credit Ratings		X	X		
	Exempt from Federal Income Tax		X	X		
	Local Fund Transfers			X		
	Lower Cost/MWH for Generation					X

		Ownership			Operations	
		IOU	Coop	Public	G&T/IPP	RTO
Disadvantages	Potential for Higher Rates	X				
	Less Local Control	X				
	Delayed 100% Renewable Target	X			X	
	Hire All New Staff		X			
	Higher Capital Costs	X			X	
	Slow Adoption of Distributed Generation	X			X	
	Potential for Non-Hawaiian Control	X			X	
	Restricted Access to Outside Capital Funding		X	X		X
	Limited Expertise for System Operations		X	X		
	Revenue Transfer to Other County Operations			X		
	High Debt Service Coverage Ratio		X			

RECOMMENDATIONS AND CONCLUSIONS

Guernsey believes the ideal path forward to meet the County's objectives is to organize, develop and enable a private entity akin to an Independent System Operator (ISO) or Regional Transmission Operator (RTO) to oversee the electric grid and energy market while ensuring a reliable power supply, adequate transmission infrastructure, competitive wholesale prices and fair access for renewable power. This approach has several notable advantages.

There would be little physical infrastructure that would need to change hands, and as such the capital costs for this approach are relatively low. The ISO/RTO would need to acquire existing dispatch, monitoring and control equipment in order to manage the transmission/distribution system; however, the great majority of existing MECO generation assets along with MECO transmission and distributions wires would remain with MECO.

This approach has the potential for quickest implementation, although a timeline is highly uncertain. The County would need to organize political capital to introduce, negotiate and enact enabling legislation at the State level which would take an unknown amount of time. However, given enough political willpower this route could be completed much more quickly than a negotiated sale or condemnation of the MECO assets, which could take five to seven years or longer. Additionally, this approach can be implemented regardless of the outcome of the HEI/NextEra merger; whatever the regulated electric utility provider for Maui County might be, the utility would be subject to the jurisdiction of the ISO/RTO.

This approach promotes competition by providing clear price signals and market transparency so that power producers of all types can make rational economic decisions; this approach also optimizes transmission planning such that all power producers are incorporated into planning and infrastructure improvement efforts.

Should the ISO/RTO approach be unacceptable or not capable of being accomplished, **Guernsey** believes that the most technically advantageous route to enhanced renewables integration must include a change of ownership of some or all of MECO's existing assets. At a minimum, MECO's transmission and distribution assets (including its dispatch control center) would need to be acquired by a third party, with such third party being empowered to function substantially similar to an ISO/RTO. If such empowerment could not be obtained, then MECO's generation assets would also need to be acquired to achieve the desired results.

Of the two primary alternatives for third-party ownership – cooperative or municipal – **Guernsey** believes the most practical choice to be a cooperative business model. Legal issues aside, there are practical considerations such as public procurement laws, collective bargaining and bond ratings that make the municipal route more problematic than following a cooperative path.

In order to purchase MECO's assets, a third party could expect to pay from a low of $525 million (book value) to a high of $867 million (replacement cost new less depreciation) depending on negotiations or the result of a condemnation / eminent domain action. In either a municipal or cooperative business model, it is expected that most if not all of the purchase price would need to be debt financed. The debt financings of either business model would include requirements for a debt service coverage ratio, or a multiple placed upon revenue requirements of the new utility; in the case of a cooperative, **Guernsey** expects this coverage ratio could be 1.25 or greater. Based upon our analysis, we find the debt service coverage ratio will offset some of the benefits of overall lower cost of capital and exemption from income taxes; however, overall utility rates could nevertheless decrease approximately six percent assuming the new owner can acquire the utility assets at close to net book value and operate those assets at least as efficiently as MECO currently does. Under a cooperative business model, the marginal revenue collections related to achieving the debt service coverage ratio would eventually be returned to customers in the form of capital credits. Capital credits are typically returned to customers in an orderly fashion on a rotational basis from ten to twenty years.